Appendix 3

RECENTLY IMPLEMENTED CONSERVATION MEASURES

The health of wild steelhead and other fish species in the lower Columbia River and in other parts of the state has declined in recent years (WDF et al. 1993; Appendix 2). As an indication of the severity of these declines many species, including lower Columbia River steelhead are now undergoing status reviews after being petitioned for listing under the Endangered Species Act (ESA).

The Lower Columbia Steelhead Conservation Initiative (LCSCI) represents a comprehensive and broadly based yet focused effort to protect and restore wild steelhead stocks in lower Columbia River tributaries. The LCSCI will also develop a platform for consideration of issues and conservation measures needed for ESA deliberations for other species of concern in the area.

Although the LCSCI represents the first formal effort to comprehensively address species risks and conservation responses in the lower Columbia River area, there have been numerous conservation strategies and measures that have been taken prior to and during development of this initiative. The purpose of this appendix is to characterize recently implemented conservation measures in the LCSCI area.

Fish Management

As a primary component of its mandate to preserve, protect, and perpetuate the fish and wildlife resources of the state of Washington, the Washington Department of Fish and Wildlife (WDFW) routinely addresses stewardship issues for wild steelhead. WDFW strives to manage utilization interests for consistency with conservation objectives. Fish management processes occur at both the statewide and regional levels. Due to increasing stock status declines and conservation concerns for Columbia River steelhead over the last decade, WDFW has increased its efforts, within its authority, to improve management to the benefit of wild steelhead. This section of the appendix characterizes WDFW's recent actions.

Genetic conservation

Long term productivity of wild steelhead requires a diversity of populations that are adapted to their local environments. Loss of genetic diversity both within and between populations increases risks to wild steelhead stocks and their productivity. Genetic risks to wild steelhead exist from several factors for decline (Chapter 14), including small populations size, gene flow from hatchery fish, fishery selectivity, and habitat fragmentation and loss. WDFW has recently acted to reduce risks to wild steelhead in the LCSCI area due to losses of genetic diversity and long term productivity.

The purpose of the WDFW hatchery steelhead program is to provide harvest opportunity consistent with wild steelhead conservation and restoration goals, including genetic

conservation. A number of strategies and actions have been recently implemented to reduce the proportion of hatchery spawners that have the potential to spawn at the same time and place as wild steelhead. These include:

1. **Exclosures**, facilities where returning adult hatchery steelhead are prevented from entering wild production areas and can be removed after passing through a fishery and/or retained and transported to lower river fisheries, provided genetic risk can be effectively managed;
2. **Rearing strategies**, where hatchery steelhead are raised and/or released in the lower river away from wild fish production areas;
3. **Temporal spawner isolation**, where the timing of hatchery steelhead that escape harvest and spawn naturally is advanced so that hatchery steelhead complete spawning before wild steelhead begin; and
4. **Stocking level adjustments**, where the number of smolts is released is reduced to limit the number of hatchery steelhead spawning with wild steelhead.

Some actions such as exclosures and removal of adult hatchery steelhead have immediate results on risks of hatchery-wild interbreeding, whereas others such as modifying rearing strategies, spawning time adjustments, and stocking level adjustments will not be observable until adult steelhead return in subsequent years (minimum of two years).

Exclosures

Recently, WDFW has increased to the percentage of wild steelhead spawning in natural production areas by preventing access of hatchery steelhead. This concept is not new. For example, WDFW installed traps on the North Fork of the Toutle River in 1988 and in Trout Creek, a tributary of the Wind River in 1992. Since that time only wild steelhead have been allowed passage upstream from the traps. Similarly, in 1996, as part of the Cowlitz Falls reintroduction program only wild steelhead or a special hatchery steelhead broodstock specifically used for supplementation purposes were released into the upper Cowlitz and Cispus Rivers.

Beginning in late 1996, WDFW took actions to reduce the number of hatchery steelhead accessing the area above Kalama Falls on the Kalama River. Most steelhead pass through the fish ladder at Kalama Falls Hatchery (KFH) at river mile 10. However, some steelhead are able to jump the falls between May and October; most of these are summer steelhead, and possibly a few wild winter steelhead. The falls appear to be a total barrier to hatchery winter steelhead.

Starting December 24, 1996, no adult hatchery winter steelhead were allowed passage above the falls. A total of 145 hatchery winter steelhead were excluded from the upper Kalama River. Thus preliminary estimates indicated 90% of the steelhead population spawning above KFH in the winter-spring of 1996-97 was wild. The percentage of hatchery fish (10%) was significantly less than the pervious percentage five-year average

of 31%. When the data were adjusted to account for temporal differences in spawning time, the percentage of hatchery steelhead decreases from 10% to 3%.

All 145 hatchery winter steelhead were trucked back to the lower river and released (recycled) to provide additional harvest opportunity for anglers. The potential exists for interbreeding between later spawning hatchery fish and early timed wild fish. Therefore, to address this risk, any hatchery steelhead returning after February 1 were not recycled to the river. High quality fish were donated to local food banks and low quality fish were used for stream nutrient enhancement projects in the area. WDFW monitored the Kalama River steelhead fishery to determine the effectiveness of the recycling program. A preliminary estimate on recycling program is expected to be available in December of 1997.

Efforts were also made to reduce the number of adult hatchery summer steelhead passing above KFH. On May 30, 1997, WDFW began recycling hatchery steelhead to the lower river, and the last hatchery fish was passed above KFH on June 5, 1997. Approximately 50% of the summer steelhead are known to successfully jump over Kalama Falls without entering the fishway trap. To reduce jumper success a temporary barrier was installed to regulate the number of hatchery steelhead passing Kalama Falls. The barrier remained in place until September 17 when high flows and debris made its continued operation infeasible. The barrier was not reinstalled since jumper success in late September and October is known to be very low during those months.

Based on limited monitoring of actual jumping activity the barrier appeared to be effective. Snorkel surveys performed in the upper Kalama River watershed in September, 1997 (prior to completion of the 1997-98 summer steelhead return cycle) indicated the barrier had a major effect but hatchery summer steelhead were not completely excluded. About 64% of the summer steelhead observed during the snorkel survey were hatchery summer fish. It is unclear to what extent the barrier may have allowed passage; future refinements are planned. Regardless, the actual percentage of the total spawning population comprised of hatchery spawners was likely less than 64% since harvest of hatchery steelhead continued in the upper watershed and since numbers of wild summer steelhead will continue to be passed upstream on into the spring of 1998.

Preliminary estimates indicate that efforts to block passage of hatchery summer steelhead at KFH in 1997 may reduce the percentage of hatchery spawners in upstream wild spawning areas from over 80% to less than 60%. Installation of the barrier device would further reduce the number and percentage of hatchery summer-run spawners. As of mid-October, 1997, about 680 hatchery summer steelhead had been recycled to the lower Kalama River. The recycling program is being monitored by WDFW and results will be available at a later date.

In 1997, WDFW increased efforts to trap and remove hatchery steelhead from the West Fork of the Grays, Elochoman, and Washougal rivers. Traps remained open through March 31. At Skamania Hatchery on the Washougal River, all hatchery steelhead trapped

were used for brood stock purposes. The Grays River trap was inoperable due to high flows which caused gravel to inundate the weir.

The Beaver Creek Hatchery is located on the Elochoman River. Winter steelhead were trapped there through March 1997. After brood stock needs were met, a total of 226 trapped hatchery winter steelhead were recycled to the lower river. This occurred through January 31. After February 1, trapped hatchery winter steelhead were not recycled to manage risks from interbreeding with wild steelhead spawners. Starting with the 1997-98 winter steelhead return cycle, in addition to the above actions WDFW intends to exclude hatchery steelhead from Cedar Creek, a tributary to the NF Lewis River, and from Abernathy Creek. The availability of Phase 2 funding will have bearing on these options.

Rearing strategies

Steelhead have strong homing instincts. This behavior can be taken advantage of to improve management of hatchery steelhead. Juvenile steelhead can be reared for a time (acclimated) at trap sites to condition them to return to certain area upon their return as adults. Acclimation affords a good opportunity to focus homing towards lower river areas where fisheries can be provided, and then trapping hatchery fish escaping harvest for recycling back to lower river areas to bolster harvest opportunity. WDFW has long used this strategy at Skamania, and Beaver Creek hatcheries to maintain brood stock programs. Acclimation at Gobar Pond, on a Kalama River tributary above the KFH trap, allowed the use of this strategy in the Kalama River watershed in 1997.

In 1995, hatchery steelhead acclimation efforts were expanded to the Grays River, where a adult steelhead can be trapped at the hatchery. Due to potential Mitchell Act budget reductions and operational problems with the shifting river channel, trapping may no longer be possible at the hatchery. In 1996, hatchery steelhead were acclimated at the North Toutle Hatchery on the Green River (NF Toutle). Plans are in place to trap returning adult hatchery steelhead in conjunction with salmon in 1998. Fish will be removed in late fall and used for stream nutrient enhancement projects.

Acclimation facilities are not utilized in the Coweeman and SF Toutle rivers, or Salmon Creek. As an alternative, hatchery smolts are directly released into lower stream reaches of Rock and Hamilton creeks, the East Fork Lewis River, and Germany and Skamokawa creeks. For example, WDFW East Fork Lewis River releases are now made at River Miles 10 and 14 compared to past releases at River Mile 27. Although lower river acclimation or direct releases are not as effective as acclimation combined with removal, these rearing strategies reduce interbreeding risks. The lower portions of these waters generally have good access for anglers so that hatchery steelhead can be harvested at high rates. Most wild steelhead production areas exist in upper portions of these basins, and lower river releases help separate hatchery steelhead from wild steelhead in upper river spawning areas..

WDFW has cooperated with the U. S. Fish and Wildlife Service (USFWS) to manage genetic risks in two locations. In 1997, hatchery steelhead were acclimated at the USFWS hatchery on Abernathy Creek. If Phase 2 funding can be obtained an electric weir and trap will operate during the winter season to remove returning hatchery winter steelhead from Abernathy Creek. Discussions are also underway regarding the potential to acclimate hatchery steelhead at the Carson National Fish Hatchery on the Wind River, to help reduce genetic risks.

Temporal spawning isolation

Advancing the time at which hatchery steelhead spawn to increase the probability that they have completed spawning before wild steelhead spawning begins can reduce genetic risks due to interbreeding. Spawning time is under partial genetic control and can be changed using selective breeding techniques. Since hatchery winter steelhead spawn shortly after entry into freshwater there is limited opportunity to reasonably change their spawning time without affecting fish quality. However, summer steelhead are immature upon entry to freshwater, providing an opportunity to advance spawning time while maintaining fish that are desirable by sport anglers.

Skamania Hatchery is the source for all hatchery summer steelhead smolts that WDFW releases in the LCSCI area, with the exception of the Cowlitz and Lewis rivers. Wild steelhead from the Washougal River (and Klickitat River) were used to originate this program several decades ago. Wild steelhead, trapped at the Skamania Hatchery between 1957-60, spawned from early February to late April. By the early 1990s spawning time had been advanced and occurred from early December to mid-March. WDFW has continued to advance spawning time and in 1996-97 spawning occurred from early December to early January. The change in spawning timing by hatchery summer steelhead reduces the possibility that they encounter and successfully spawn with wild steelhead.

It is important to emphasize a cautionary note about this strategy. Although steelhead managers have shown it is possible to purposefully advance the spawning time of hatchery steelhead to reduce the incidence and extent of interbreeding, selective breeding does not eliminate, and may even increase, overall genetic risks to wild stocks. It is known that selective breeding can lead to changes in various desired fish attributes. However, to be successful, selective breeding entails use of only a limited number of broodstock, the vast majority of which have the characteristics desired. Thus, use of a limited broodstock reduces genetic diversity in the offspring population. This reduced diversity means that in the event that any selectively bred hatchery offspring do interbreed with wild steelhead, the effects can be even more serious. An ideal situation for use of selectively bred hatchery fish might occur when: (1) their spawning times are completely isolated from wild spawners (after considering a wide range of natural variation in return timing, for both hatchery and wild fish), and (2) they do not contribute surviving offspring (whether spawning with either another hatchery fish or a wild fish) that might spawn with wild fish in a subsequent generation. Regarding the second point, any hatchery-wild matings that

occur for which no offspring survive essentially eliminates the wild spawner from the spawning population, increasing both genetic and demographic risks.

Stocking level adjustments

In some cases there may be no reasonable options where exclosures, acclimation, or other opportunities are available to effectively manage genetic (or ecological) risks. Those instances may require that the number of hatchery smolts released be reduced. For example, over 80,000 hatchery summer steelhead smolts were released into the Wind River in the 1960s. However, by the 1980s the number of smolts released was reduced to 40,000, and releases in 1997 were further reduced to less than 20,000. Similar reductions have occurred in the East Fork Lewis River, where releases have been reduced from over 100,000 to 40,000 smolts.

Fisheries

Managing fisheries to provide adequate numbers of spawners is critical when objectives call for maintaining or rebuilding wild steelhead populations. WDFW is committed to provide steelhead fisheries opportunity consistent with wild steelhead protection and restoration. Fishery sanctuary waters have been implemented to protect wild summer steelhead from harvest in the Kalama and Wind Rivers since the1950s. Actions have consistently been taken action to reduce the impacts of fisheries to wild steelhead. Wild Steelhead Release regulations were enacted in the mid-1980s for summer steelhead in lower Columbia River tributaries, followed by similar action for winter steelhead by the early 1990s. These regulations prohibit retention of wild steelhead and continue today. In addition, current regulations allow for legal harvest of no more than two trout over 8-inches and two hatchery steelhead. Since the vast majority of steelhead juveniles migrate to sea before achieving a size of 8 inches and all returning wild steelhead adults must be released, wild steelhead receive full protection from harvest.

In 1997, due to concerns about the declining numbers of wild steelhead in the LCSCI area, WDFW adopted restrictive emergency fishing regulations. On August 29, 1997, the Wind River above Shipherd Falls was closed to fishing. This area represents over 99% of the basin. On September 20, 1997, the East Fork Lewis River above Sunset Falls was closed to fishing and fishing above Kalama Falls was restricted to selective fishery regulations. All regulation changes afforded wild summer steelhead considerable additional protection.

WDFW recently liberalized winter steelhead regulations to increase harvest of hatchery fish in certain streams. Since hatchery winter steelhead arrive earlier than wild winter steelhead implementing this strategy can reduce the number of hatchery spawners without impacting wild steelhead. In January ,1997 a previously closed ¼ mile section of the Kalama River below Kalama Falls was opened to increase the harvest of hatchery steelhead. At the same time, the closed area adjacent to the Beaver Creek Hatchery on the Elochoman River was opened to fishing to promote the harvest of hatchery steelhead.

Ecological risks

In addition to reducing genetic risks, reductions in ecological risks to wild steelhead have also occurred by the exclosure, rearing strategy, and stocking level adjustment strategies described above. All of those actions lead to reduced numbers of hatchery fish and their offspring in wild steelhead production areas, allowing more food and space for wild steelhead.

Reductions in salmon and steelhead run sizes have lead to corresponding decreases in the number of carcasses available to infuse nutrients into watersheds. Placement of surplus hatchery steelhead and salmon carcasses will benefit production by stream rearing salmonids, including steelhead. In the spring of 1997, stream nutrient enhancement projects were conducted on tributaries of the lower Columbia River. These projects were implemented in cooperation with various groups, including the Southwest Washington Anglers, Fish First, the Lower Columbia River Enhancement Group, and others. Approximately 200 carcasses were placed in the East Fork Lewis River watershed. In addition some carcasses were placed in the Kalama River and Elochoman River watersheds. Prior to 1997, hatchery carcasses were not used for nutrient enhancement.

Presently, surplus hatchery coho and fall chinook salmon are being collected from hatcheries on the Grays, Elochoman, Kalama, Lewis, and Washougal rivers. It is anticipated that over 4,000 carcasses from hatchery fish will be dispersed into these watersheds in the near term. Approximately 1,000 carcasses have been dispersed in the Grays and Washougal river systems. Dispersal of hatchery steelhead is planned for the winter of 1998.

Habitat

The following provides only a limited and brief outline of some recent measures that have been implemented to improve habitat for steelhead in the LCSCI area. Additional information will be provided in future drafts of the initiative.

Local governments

Habitat Conservation Ordinance – Clark county has developed a Habitat Conservation Ordinance to satisfy Growth Management Act requirements. This ordinance includes development and vegetation removal restrictions that effectively prevent deleterious impacts to steelhead habitat in Clark county. The ordinance has adopted WDFW's Priority Habitat and Species (1995) criteria for the protection of riparian habitats.

Gravel mining moratorium – Clark county has recently imposed a prohibition on mining activities within the 100-year flood plain. This action restricts detrimental channel modification as a result of gravel mining. The East Fork Lewis River has had substantial substrate extraction dating before the construction of Interstate-5. In November, 1996,

the river began reclaiming its former channel and has increased channel diversity while improving spawning substrate.

East Fork Lewis River land acquisition – Since 1992, Clark county has purchased approximately 1500 acres of the East Fork Lewis River flood plain. Clark county's initiation to develop a green way along the course of the river has and will continue to improve steelhead habitat. Clark county has initiated a similar program in Salmon Creek.

Salmon Creek habitat restoration – Clark Public Utilities has initiated habitat improvement projects in Salmon Creek. They have allocated an estimated $250,000 annually to stabilize eroding banks, fence riparian pastures, plant native vegetation along riparian habitats, and improve water quality. They have proposed increasing their level of habitat restoration to include the East Fork Lewis River.

State government

WDNR HCP – The Washington Department of Natural Resources has acquired an Habitat Conservation Plan from the USFWS for state lands, which significantly improves in-stream and riparian habitats compared to forest practice regulations.

Forest Practice Board riparian buffer increases –

In 1996, the Washington Forest Practice Board enacted an emergency water type designation change to reflect stronger protection for fish in smaller headwater streams. This rule change converted all waters of the state from a Type 4 (presumed to contain no fish) to a Type 3 (presumed to contain fish unless otherwise proved).

Federal government

USFS riparian reserves --

Tributary Dams/Hydropower

Most conservation measures related to dams and hydroelectric projects are occurring independently from the LCSCI. Most of these measures are being developed in preparation for relicensing hydroelectric projects by the Federal Energy Regulatory Commission (FERC). The Cowlitz Falls and upper Cowlitz anadromous fish restoration program is proceeding independently as a result of a settlement between Bonneville Power Administration (BPA) and the Friends of the Cowlitz. That program has participation from Tacoma Public Utilities (TPU) because of TPU's interest in relicensing its Cowlitz hydroelectric project. Hemlock Dam fish passage was improved by the U.S. Forest Service independently from LCSCI. All these measures are listed as conservation measures in Chapter 14 (Subchapter 3).

Conservation measures that are a direct result of the LCSCI include some of those proposed by PacifiCorp, although these measures also will influence relicensing of PacifiCorp's Lewis River projects.

The clusters of hydroelectric projects on the Cowlitz and Lewis rivers have created a number of factors for decline. During FERC project relicensing, state and federal fish and wildlife agencies will recommend and/or require measures to mitigate the factors for decline attributable to these projects. Environmental laws that affect FERC licensing requirements are stronger and more numerous than when initial FERC licenses were issued. A key example is the Cowlitz project, which was built after the U.S. Supreme Court ruled that a Washington state law, the Columbia River anadromous fish sanctuary (RCW 75.20.110), was preempted by the Federal Power Act. The Washington law would have prohibited construction of the Cowlitz project, thereby protecting a major part of the steelhead population in the Cowlitz and the Lower Columbia steelhead ESU. Subsequent passage, interpretation, and implementation of the federal Clean Water Act might have resulted in avoiding preemption of the Columbia River anadromous fish sanctuary law if initial licensing had occurred under today's laws.

For each group of projects, likely recommendations/requirements are listed below in order of the priority of the factor for decline. Dam removal is being considered as a restoration measure for wild salmonids in some basins, but no dam removal is anticipated in the Lewis and Cowlitz basins, so the measures are intended as mitigation for ongoing impacts of projects.

Factor(s) for decline	Probable type of mitigation recommendation	Prospects for success
1. Downstream passage for juvenile steelhead	Smolt collection facilities at multiple locations and transport and release of fish below dams	Difficult, but improving, and juvenile steelhead are the easiest of anadromous salmonids to pass downstream
2. Downstream passage for juvenile steelhead	Improve screening of intakes in conjunction with smolt collection facilities	Effective screening is very expensive at large intakes. Much work at many projects has led to improvements in collection efficiency, but major problems remain.
3. Upstream passage of adult steelhead	Trap-and-haul might be the most effective measure to move fish around entire complex of dams and reservoirs	Handling mortality can be high.

Factor(s) for decline	Probable type of mitigation recommendation	Prospects for success
4. Upstream passage of adult salmon to provide carcasses for watershed nutrients	Trap-and-haul might be the most effective measure to move fish around entire complex of dams and reservoirs.	Handling mortality can be high, but carcasses can be distributed with minimal loss of effectiveness.
5. Upstream passage of adult salmon to provide carcasses for watershed nutrients	Transport and distribute salmon carcasses from hatcheries to tributaries.	High feasibility, depending on access and personnel availability, but some flexibility.
6. Elimination of stream habitat as a result of inundation and conversion from lotic to lentic has resulted in loss of production of steelhead from those inundated stream reaches	Hatchery production was the mitigation/replacement measure for this impact under existing FERC licenses. Emphasis on replacement with hatchery production will continue, including upgrading to achieve mitigation obligations, while managing hatchery fish to minimize adverse effects on wild population genetics and wild fish production.	High feasibility, limited by degree of cooperation and commitment to objectives by utilities.
7. Flow management, both level of flow and timing and rate of change of flow (ramping and flow continuation), can affect steelhead in a variety of ways	Instream flows and ramping rates are recommended by time of year and time of day. Only one project (Swift No. 2) has no instream flows now. Others may require modification.	Effectiveness of flow management is variable, with some aspects of dam impacts mitigable, but other long-term impacts on channel structure less easily mitigated. The long-term effects of storage dams control productivity and ecology of the entire river system and these effects are more difficult to mitigate with instream flow prescriptions.
8. Gas supersaturation, caused by plunging water over a spillway, causes mortality of fish downstream. Spill, which produces gas supersaturation, is a rare	Dam spillway modification to flip spilling water into the air before it hits the water can reduce gas supersaturation.	Highly effective but expensive, considering the rarity of spill.

Factor(s) for decline	Probable type of mitigation recommendation	Prospects for success
event at the Cowlitz and Lewis projects, but is more common on the mainstem Columbia projects, where it is a downstream passage measure.		
Downstream passage through reservoirs	Increase flow rate through reservoirs and manage stage/rule curve to avoid stranding	